

## WE CLAIM:

1. A tunable optical device comprising:

5 a compression tuned optical structure, responsive to an optical signal, and further responsive to a displacement sensor signal, for providing a compression tuned optical structure signal containing information about a change in an optical characteristic of the compression tuned optical structure, and for further providing an excitation caused by a change in a displacement of the compression tuned optical structure; and

10 a displacement sensor, responsive to the excitation, for providing the displacement sensor signal containing information about the change in the displacement of the compression tuned optical structure.

15 2. A tunable optical device according to claim 1, wherein the displacement sensor includes a capacitance sensor coupled to the compression tuned optical structure for measuring a change in capacitance that depends on a change in displacement.

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3. A tunable optical device according to claim 1,  
wherein the capacitance sensor includes two parallel and  
opposing plates and the change in capacitance depends on a  
change in a gap or an area with respect to the two parallel  
and opposing plates.

4. A tunable optical device according to claim 2,  
wherein the change in the displacement of the compression  
tuned optical structure causes a change in the gap between  
the two parallel and opposing plates, and the change in  
capacitance depends on the change in the gap.

5. A tunable optical device according to claim 2,  
wherein the change in the displacement of the compression  
tuned optical structure causes a change in an overlapping  
area between the two parallel and opposing plates, and the  
change in capacitance depends on the change in the  
overlapping area.

6. A tunable optical device according to claim 1,  
wherein the compression tuned optical structure has a  
capacitance sensor having two metallic-coated tubes affixed  
to the compression tuned optical structure so that metallic  
surfaces face each other with a small gap inbetween.

7. A tunable optical device according to claim 6,  
wherein the small gap is about 200 micron.

5 8. A tunable optical device according to claim 4,  
wherein the compression tuned optical structure is a  
dogbone structure having wider end portions separated by a  
narrower intermediate portion; and

wherein each of the two metallic-coated tubes is  
affixed to or formed on a respective one of the wider end  
portions.

9. A tunable optical device according to claim 4,  
wherein the capacitance sensor has electrodes attached to  
the metallic-coated tubes to allow connection of the  
capacitor sensor to a displacement sensor circuit capable of  
measuring capacitance.

10. A tunable optical device according to claim <sup>8</sup><sub>A</sub>,  
wherein the narrower intermediate portion has a fiber Bragg  
grating arranged therein.

11. A tunable optical device according to claim 4,  
wherein the narrower intermediate portion has a Fabry-Perot  
interferometer arranged therein.

5 12. A tunable optical device according to claim 1,  
wherein the displacement sensor includes a tube-in-tube  
capacitance sensor arrangement.

10 13. A tunable optical device according to claim 12,  
wherein the tube-in-tube capacitance sensor arrangement  
includes an inner tube with an inner capacitive plate and an  
outer tube with an outer capacitive plate.

15 14. A tunable optical device according to claim 1,  
wherein the displacement sensor includes a single tube  
capacitance sensor arrangement.

20 15. A tunable optical device according to claim 14,  
wherein the single tube capacitance sensor arrangement  
includes a tube with a first capacitive plate for  
capacitively cooperating with a second capacitive plate  
arranged on a surface of the compression tuned optical  
structure.

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16. A tunable optical device according to claim 1,  
wherein the displacement sensor includes multiple tube-in-  
tube capacitance sensor arrangement.

5           17. A tunable optical device according to claim 16,  
wherein the multiple tube-in-tube capacitance sensor  
arrangement includes multiple inner tubes with respective  
inner capacitive plates and multiple outer tubes with  
multiple outer capacitive plates.

10           18. A tunable optical device according to claim 1,  
wherein the displacement sensor includes a differential  
capacitance sensor arrangement.

15           19. A tunable optical device according to claim 1,  
wherein the differential capacitance sensor arrangement  
include a first variable capacitor and a second variable  
capacitor.

20. A tunable optical device comprising:

a compression tuned optical structure, responsive to an optical signal, and further responsive to a sensor signal, for providing a compression tuned optical structure signal containing information about a change in an optical characteristic of the compression tuned optical structure, and for further providing an excitation caused by a change in a physical parameter in relation to the compression tuned optical structure; and

a sensor, responsive to the excitation, for providing the sensor signal containing information about the change in the physical parameter in relation to the compression tuned optical structure.

21. A tunable optical device according to claim 20, wherein the sensor senses a displacement in relation to the compression tuned optical structure.

22. A method for tuning a wavelength of a grating comprising the steps of:

obtaining a compression tunable element having a Bragg grating therein, the compression tunable element having a capacitor across the Bragg grating, the capacitor having plates and a gap inbetween that is related to the wavelength of the grating;

measuring a capacitance value of the capacitor; and

compressing the compression tunable element to set a desired grating wavelength based on the capacitive value.